This document contains Part 3 (pp.57–63) of Chapter 2 of the National Coastal Condition Report III.

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National Coastal Condition Report III

Chapter 2: National Coastal Condition

Part 3 of 5

December 2008

Trends of Coastal Monitoring Data—United States

Coastal condition for the United States has been estimated since 1991, when both the Virginian and Louisianian provinces (Figure 2-14) were first surveyed concurrently. Annual surveys of coastal condition were conducted in the Virginian Province from 1990 through 1993 and 1997 through 1998; in the Louisianian Province from 1991 through 1994; in the Carolinian Province from 1995 through 1997; and in the West Indian Province in 1995. Beginning in 2000, the coastal waters of all regions of the United States (exclusive of Alaska, Hawaii, and the Island Territories) have

been surveyed and assessed annually. In 2001, the NCCR I was produced and included information for the period 1990 through 1996 from the Virginian, Carolinian, West Indian, and Louisianian provinces (the Acadian, Californian, and Columbian provinces; Island Territories; Alaska; and Hawaii were largely excluded from this report). In 2004, the NCCR II included an assessment of all of the coastal ecosystems in the conterminous United States and Puerto Rico for the period 1997 through 2000. This NCCR III provides an assessment of the entire continental United States, Southcentral Alaska, Hawaii, and Puerto Rico for the years 2001 and 2002.
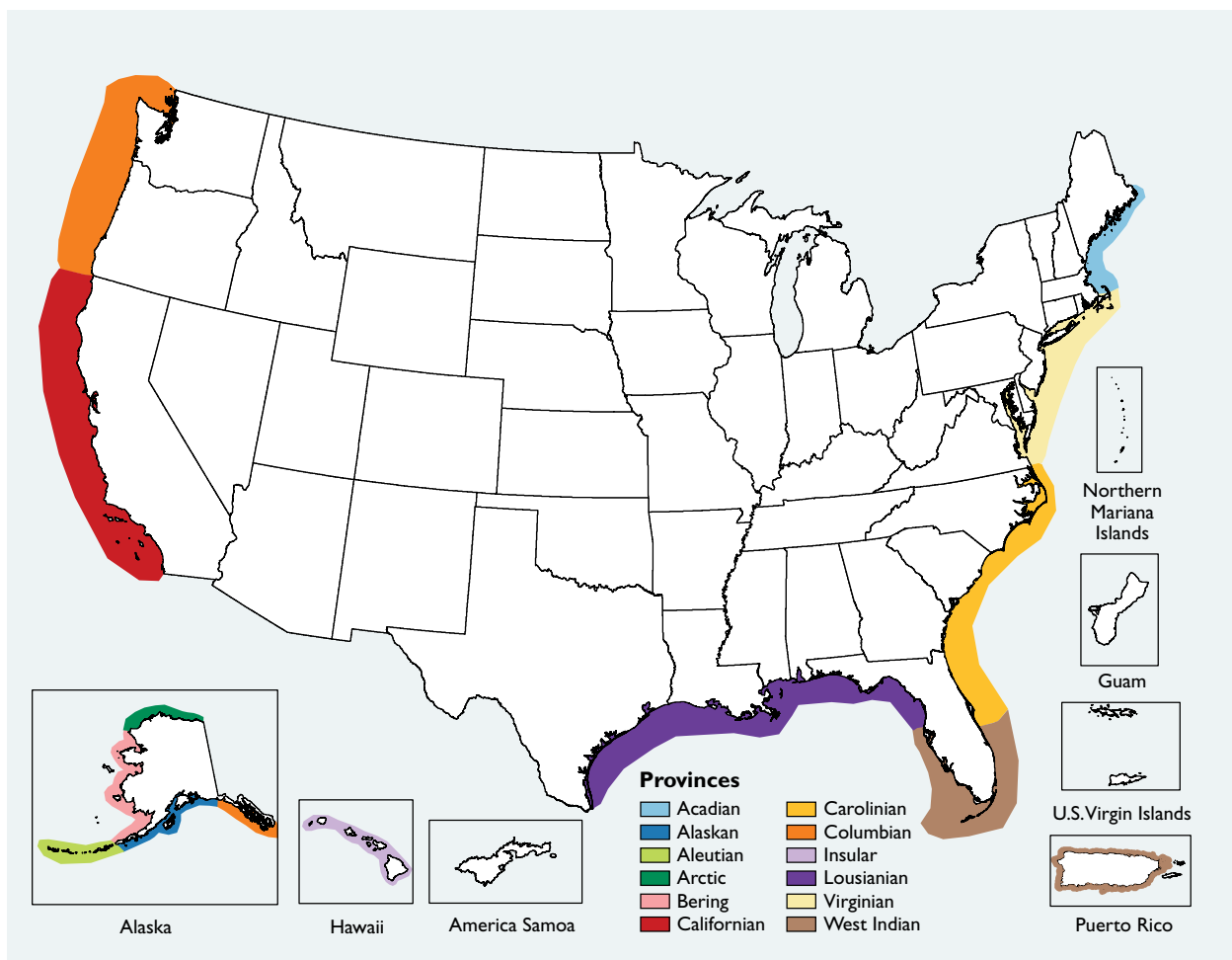

Provinces

Acadian	Carolinian
Alaskan	Columbian
Aleutian	Insular
Arctic	Lousianian
Bering	Virginian
Californian	West Indian

**Figure 2-14.** EMAP coastal provinces (U.S. EPA).

Highlight

Conditions in U.S. National Estuary Program Estuaries

Our nation's estuaries encompass a wide variety of coastal habitats, including wetlands, salt marshes, coral reefs, mangrove and kelp forests, seagrass meadows, tidal mud flats, and upwelling areas. These estuarine habitats include cold temperate waters, as well as subtropical and tropical ecosystems. Estuaries provide spawning grounds, nurseries, shelter, and food for fish, shellfish, and other wildlife species, as well as nesting, resting, feeding, and breeding habitat for 75% of waterfowl and other migratory birds (U.S. EPA, 1998b). Estuaries are also a vital part of our national economy, providing areas used for recreation, tourism, commercial fishing, and port facilities for domestic and international trade.

The major objective of the *National Estuary Program Coastal Condition Report* (NEP CCR) is to document the condition of the nation's 28 National Estuary Program (NEP) estuaries—a subset of the nation's estuaries that have been designated as Estuaries of National Significance. NEP estuaries were nominated for inclusion in the NEP because they were deemed threatened by pollution, human development, or overuse. The Clean Water Act requires that the EPA report periodically on the condition of the nation's estuarine waters. As part of the 1987 amendments to the Clean Water Act, the Section 320 NEP promotes comprehensive planning efforts to help protect these nationally significant estuaries through their individual estuarine-specific programs.

Data collected from 1999 to 2003 by EPA's NCA were used to rate the NEP estuaries individually, regionally, and nationally using four primary indices of estuarine condition (water quality, sediment quality, benthic condition, and fish tissue contaminant concentrations). The coastal habitat index was not evaluated for this report because the NWI data were not available on the estuary level. The NEP CCR presents the following two major types of data for each NEP estuary: (1) estuarine monitoring data collected as part of the NCA, and (2) estuarine monitoring data collected by the individual NEPs and/or NEP partners, which may include state agencies, universities, and volunteer monitoring groups.

The estuarine condition ratings developed in the NEP CCR are based solely on NCA estuarine monitoring data because these data are the most comprehensive and nationally consistent data available related to estuarine condition. The report uses these data in assessing estuarine condition by evaluating the four selected indices of estuarine condition in each region of the United States (Northeast Coast, Southeast Coast, Gulf Coast, West Coast, and Puerto Rico). The resulting ratings for each index are then used to calculate an overall NEP estuary rating, an overall NEP regional rating, and an overall NEP national rating of estuarine condition. This national assessment applies
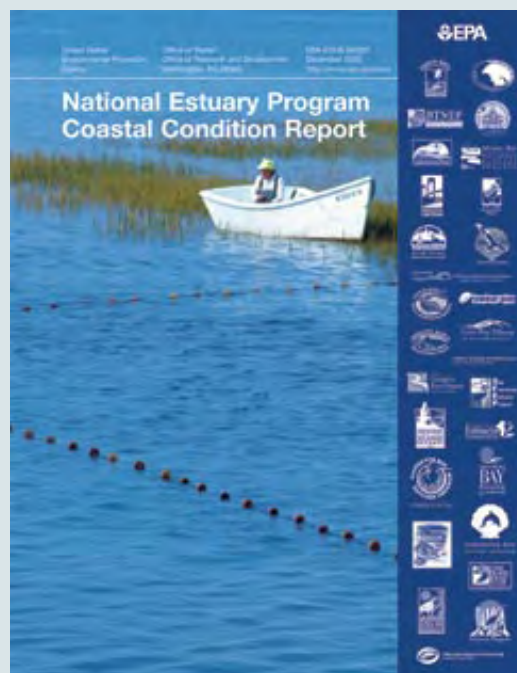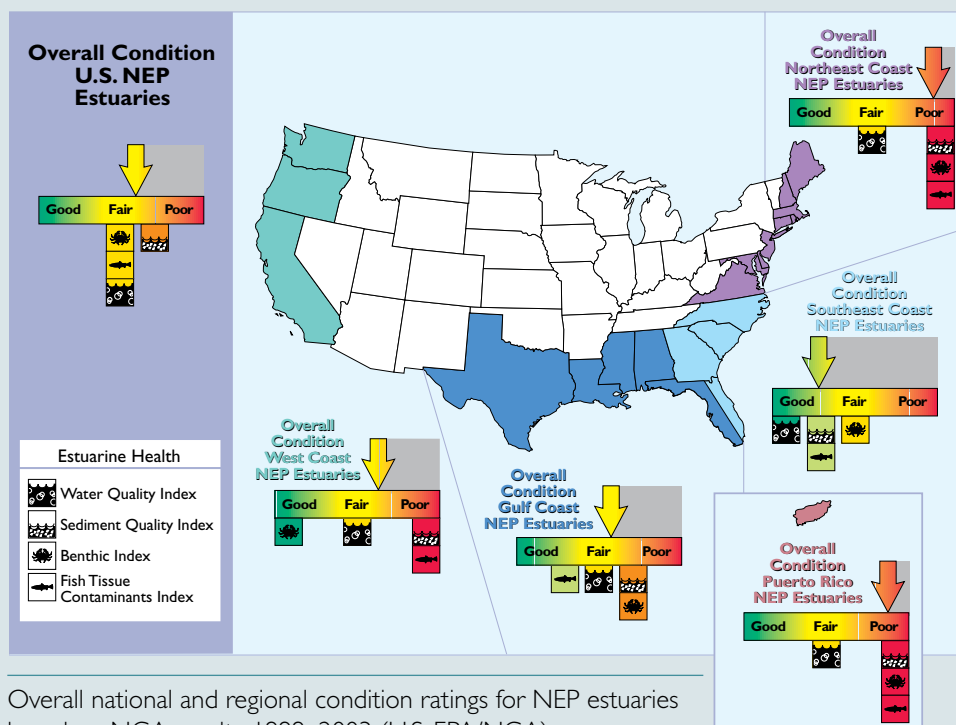
to the 28 individual NEP-designated estuaries located in 17 coastal states and the island territory of Puerto Rico (see figure). With the NEP CCR, the collaborating agencies and the individual NEPs strive to provide a benchmark of estuarine condition that paints a comprehensive picture of the nation's NEP estuaries.

The major findings of the NEP CCR include the following:

- Ecological assessment of NCA data shows that the nation's NEP estuaries are generally in fair condition nationally, but that regionally, the NEP estuaries are rated poor in Puerto Rico (San Juan Bay) and the Northeast Coast region, fair in the Gulf Coast and West Coast regions, and fair to good in the Southeast Coast region.

- The indices that show the poorest conditions throughout the United States are the sediment quality index, followed by the fish tissue contaminants index and benthic index. The index that generally shows the best condition is the water quality index.

- Nationally, 37% of NEP estuarine area is in poor condition. Regionally, roughly 100% of Puerto Rico's NEP estuarine area is in poor condition, and 46% of the Northeast Coast, 46% of the Gulf Coast, 36% of the West Coast, and 23% of the Southeast Coast NEP estuarine area is in poor condition (U.S. EPA, 2006b).

This report also provides individual NEP profiles of the nation's 28 nationally significant estuaries, including a map, background information on the NEP estuary, environmental concerns of most importance to the NEP and its stakeholders, population pressures affecting the individual NEPs, and environmental indicators used by the NEP to assess estuarine health. This information, together with data from the NCA monitoring program, provides a picture of the overall condition of the coastal resources of the nation's NEP estuaries.

Overall national and regional condition ratings for NEP estuaries based on NCA results, 1999–2003 (U.S. EPA/NCA).

A traditional trend analysis cannot be performed on the data presented in the *National Coastal Condition Report* series because the underlying population (i.e., the coastal resources included in the survey) has changed for each assessment; however, estimates have been made for the overall condition of U.S. coastal waters in each assessment. If we assume that the condition of any unsampled waterbodies has a similar distribution to the condition of those sampled, then the report provides estimates for all the coastal waters of the United States. Table 2-2 shows the primary index and overall condition scores from the three reports for each region and for the nation (including and excluding Southcentral Alaska and Hawaii).

Table 2-3 shows the percent of the nation's coastal area rated poor for overall condition and the associated overall condition scores from the three national assessments. An increase in a score and/or a decrease in the percent area in

Table 2-2. Rating Scores by Index[a] and Region Comparing the NCCR I, NCCR II, and NCCR III[b]							
		Index					Overall Condition
Region		Water Quality	Sediment Quality	Coastal Habitat	Benthic	Fish Tissue Contaminants	
Gulf Coast	v1	1	3	1	1	3	1.8
	v2	3	3	1	2	3	2.4
	v3	3	1	1	1	5	2.2
Southeast Coast	v1	4	4	2	3	5	3.6
	v2	4	4	3	3	5	3.8
	v3	3	3	3	5	4	3.6
Northeast Coast	v1	1	2	3	1	2	1.8
	v2	2	1	4	1	1	1.8
	v3	3	2	4	1	1	2.2
Southcentral Alaska	v1	–	–	–	–	–	–
	v2	–	–	–	–	–	–
	v3	5	5	–	–	5	5.0[d]
Hawaii	v1	–	–	–	–	–	–
	v2	–	–	–	–	–	–
	v3	5	4	–	–	–	4.5[d]
West Coast[c]	v1	1	2	1	3	3	2.0
	v2	3	2	1	3	1	2.0
	v3	3	2	1	5	1	2.4
Great Lakes[c]	v1	1	1	1	1	3	1.4
	v2	3	1	2	2	3	2.2
	v3	3	1	2	2	3	2.2
Puerto Rico[c]	v1	–	–	–	–	–	–
	v2	3	1	–	1	–	1.7
	v3	3	1	–	1	–	1.7
United States[e]	v1	1.5	2.3	1.6	1.5	3.1	2.0
	v2	3.2	2.1	1.7	2.0	2.7	2.3
	v3[f]	3.3	1.6	1.7	2.1	2.9	2.3
	v3[g]	3.9	2.8	1.7	2.1	3.4	2.8

[a] Rating scores are based on a 5-point system, where a score of less than 2.0 is rated poor; 2.0 to less than 2.3 is rated fair to poor; greater than 2.3 to 3.7 is rated fair; greater than 3.7 to 4.0 is rated good to fair; and greater than 4.0 is rated good.
[b] AK and HI were not reported in the NCCR I or NCCR II. The NCCR I assessment of the Northeast Coast region did not include the Acadian Province. The West Coast ratings in the NCCR I were complied using data from many different programs.
[c] West Coast, Great Lakes, and Puerto Rico scores for the NCCR III are the same as NCCR II (no new data for the NCCR III except for the West Coast benthic index).
[d] Overall condition scores for Southcentral Alaska and Hawaii were based on 2–3 of the 5 NCA indices.
[e] U.S. score is based on an areally weighted mean of regional scores.
[f] U.S. score excluding Southcentral Alaska and Hawaii.
[g] U.S. score including Southcentral Alaska and Hawaii.
v1 = NCCR (adjusted scores from Table C-1 in NCCR II); v2 = NCCR II; v3 = NCCR III

poor condition reflects improving condition for a particular index or for overall condition. In principle, a positive change in a score should correspond to a negative change in percent area in poor condition. In general, this is the case shown in Table 2-3; however, some inconsistencies exist due to several reasons, including (1) the scores represent ranges of condition, whereas the percent area in poor condition is an exact number; (2) the interpretation of values has changed as the assessments have become more sophisticated; (3) some index elements were measured only after 2000; and (4) in one case, the elements of an index reversed in importance. Although some of these inconsistencies can be adjusted through a recalculation of the percent of area or the score to "correct" differences to a common baseline for reason 2 (see Appendix C in the NCCR II), no adjustment can be made for reasons 1, 3, or 4. Figure 2-15 depicts the concurrent percent area in poor condition for each index.

From the NCCR I to NCCR III, the water quality index score for U.S. coastal waters increased from 1.5 (rated poor) to 3.3 (rated fair), with a corresponding decrease in percent area rated poor from 40% to 11%. Although water quality has likely improved during this time, the dramatic change in the water quality assessment from the NCCR I to the NCCR III is largely due to the reliance on professional judgment for eutrophication information in the NCCR I, rather than on direct measurements from surveys used for subsequent reports of the *National Coastal Condition Report* series (NCCR II, NCCR III). Nitrogen and phosphorus measurements were not

used in the NCCR I assessment; instead, a survey of professional judgment conducted by NOAA was used to assess the eutrophication status of estuaries. These judgments were based on other measures (e.g., macroalgal abundance, SAV loss, HABs) (Bricker et al., 1999). The NCCR I reported that 40% of the nation's coastal area was rated poor for water quality (rating score of 1.5). In the NCCR II, water quality in the nation's collective coastal waters improved, with a reduction in percent area rated poor (11%) and an increase in the water quality index score to 3.2 (rated fair); however, this apparent improvement in the water quality index score and the percent area in poor condition is likely not as dramatic as the assessment suggests. In the current assessment (NCCR III), 11% of the U.S. coastal area is rated poor, and the water quality index score is 3.3 (rated fair). This assessment demonstrates
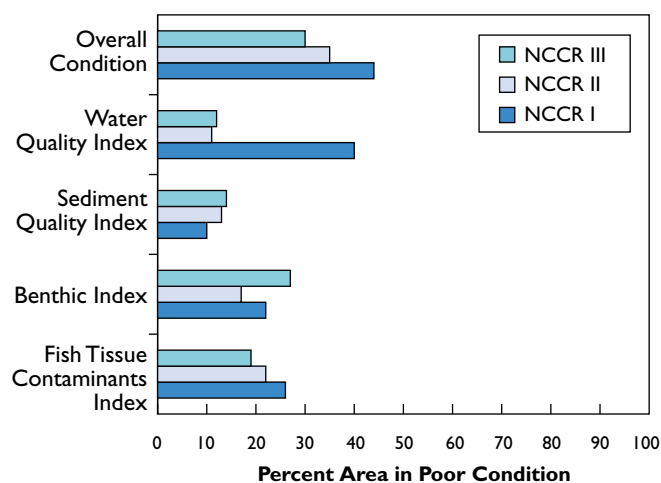

Figure 2-15. Comparison of percentage area in poor condition for the three *National Coastal Condition Report* assessments (U.S.EPA/NCA).

Table 2-3. Percentage of U.S. Coastal Area in Poor Condition and Corresponding Rating Score for the NCCR I (1990–1995), NCCR II (1996–2000), and NCCR III* (2001–2002) National Ecological Condition Assessments

Category	% Area in Poor Condition			Score		
	NCCR I	NCCR II	NCCR III	NCCR I	NCCR II	NCCR III
Water Quality Index	40	11	11	1.5	3.2	3.3
Sediment Quality Index	10	13	14	2.3	2.1	1.6
Benthic Index	22	17	27	1.5	2.0	2.1
Fish Tissue Contaminants Index	26	22	19	3.1	2.7	2.9
Overall Condition	44	35	30	2.0	2.3	2.3

*NCCR III assessment is for coastal waters in the conterminous United States (excluding Hawaii and Southcentral Alaska).

no significant change in the water quality of U.S. coastal waters since the publication of the NCCR II.

Although the percent area in poor condition changed very little (from 10% to 14%) between the NCCR I and the NCCR III, the sediment quality index score decreased from 2.3 (rated fair) to 1.6 (rated poor), respectively, between the two reports. Initially, this temporal pattern seems inconsistent because a significant decrease in the sediment quality index score should logically correspond to a significant increase in percent area in poor condition. This apparent inconsistency results from the inclusion of a sediment quality index score of 1.0 (rated poor) for the Great Lakes region in determining the sediment quality index score for the nation's coastal waters (Great Lakes were not included in calculations of percent area). Although the change in the nation's sediment quality index score between the two reports appears to be more significant than the change in the percent of coastal area rated poor, the NCCR III rating would only change from poor to fair to poor if it were based solely on percent area in poor condition. According to the regional assessment criteria, a region is rated poor if more than 15% of a region's coastal area is rated poor, and a region is rated fair if between 5% and 15% of the coastal area is rated poor. Based on the regional criteria outlined in Chapter 1 and the percent of national coastal area rated poor (14%), the sediment quality index score for the NCCR III would be 2.0 (rated fair to poor); however, when the national sediment quality index score is calculated based on the weighted average of the regional scores (including the Great Lakes sediment quality score of 1.0), the national score is reduced to 1.6 (rated poor). Similar comparisons can be made for the subsequent assessments.

The approach used by NCA does not provide any estimate of "resiliency" for a given estuarine system. An area rated poor may, in fact, be relatively healthy and have the capacity to "bounce back" from the measured poor condition at the single point in time when sampling occurred; meanwhile, some of the areas rated good may be quite vulnerable over the longer term. These phenomena should be evaluated in concert with the trend data before any decisive environmental action is taken.

The coastal habitat index assessment has not changed from the NCCR II to the NCCR III. No new information is available to assess coastal habitat changes for the NCCR III, and the scores presented in this report are identical to those presented in the NCCR II. Although some regional improvements in the coastal habitat index rating occurred in the Northeast Coast region between the NCCR I (rated fair) and the NCCR II (rated good to fair), the regions with most of the wetland acreage in the United States (Gulf Coast, Southeast Coast, and Great Lakes) showed little or no change in their index ratings. The Gulf Coast and Southeast Coast regions showed a continuing loss of wetlands at about the same rate of approximately 0.2% of available acreage between 1990 and 2000.

The benthic index, although consistent in concept, is calculated differently for each region of the United States; therefore, the assumption that unsampled regions reflect the same distribution pattern of poor conditions as those sampled is not supported. The percent of coastal area with poor

Courtesy of Andrew D. Stahl

benthic condition in the West Coast region and Acadian Province of the Northeast Coast region is consistently lower than in the Gulf Coast region and the Virginian Province of the Northeast Coast region. As a result, the U.S. benthic index score of 1.5 (rated poor) in the NCCR I corresponds to the 22% of coastal area in poor condition in the Gulf Coast region, Southeast Coast region, and Virginian Province of the Northeast Coast region. When the West Coast region and Acadian Province of the Northeast Coast region were included in the NCCR II assessment, the percent of coastal area with poor benthic condition decreased to 17% (within the uncertainty estimates for the NCCR I) and the benthic index score increased to 2.0 (rated fair to poor). However, for the NCCR III, the percent area with poor benthic condition increased to 27% (an increase of 10%), and the benthic index score increased from 2.0 to 2.1 (rated fair to poor). The percent area with poor benthic condition in the Gulf Coast region increased to 45% in the NCCR III. Although this increase in the Gulf Coast region accounts for the sizeable increase in the percent of U.S. coastal area in poor condition, it has little affect on the national benthic index score because, based on the criteria described in Chapter 1, the regional rating would be poor in both cases. This change in the Gulf Coast region—coupled with small improvements in benthic condition in the Southeast Coast and West Coast regions—results in the apparent inconsistency of a significant increase (degradation) in percent coastal area with poor benthic condition in the United States (+10%) coupled with a minimal increase in overall benthic score (+0.1).

Guidelines for Assessing Sediment Contamination (Long et al., 1995)

ERM (Effects Range Median)— Determined values for each chemical as the 50th percentile (median) in a database of ascending concentrations associated with adverse biological effects.

ERL (Effects Range Low)—Determined values for each chemical as the 10th percentile in a database of ascending concentrations associated with adverse biological effects.

Please note that some of the percentages discussed in this report differ from those published in the NCCR I or NCCR II. In some cases, data were reassessed to make the results comparable across reports. For example, the NCCR I reported that 35% percent of the national coastal area was rated poor for sediment quality. This assessment was based on criteria that included both ERM exceedances and five ERL exceedances in its estimate of percent area rated poor. These criteria changed in the NCCR II and NCCR III to reflect only ERM exceedances when calculating percent area rated poor. When the NCCR I data are reassessed using the updated criteria, the percent area rated poor is reduced to 10%.

The fish tissue contaminants index shows a consistent improvement from the NCCR I to the NCCR III. The percent of stations rated poor decreased from 26% of stations where fish were caught (NCCR I) to 19% (NCCR III). This reduction corresponds with an improvement of the fish tissue contaminants index score from the NCCR II (2.7) to the NCCR III (2.9), but is inconsistent with the reduction of the score from the NCCR I (3.1) to the NCCR II (2.7). This inconsistency is the result of comparing different methodologies. In the NCCR I, fish tissue contaminant concentrations were measured in edible fillets, whereas in both the NCCR II and NCCR III, whole-fish concentrations were measured. Currently, it is not possible to "adjust" the NCCR I assessments (fillets) to whole-fish concentrations and scores; however, research completed from 2003 through 2004, where both fillet and whole-fish concentrations were determined, will likely provide the information necessary to make that adjustment. At present, the best interpretation seems to be that there is little change in contaminant levels in fish tissue in U.S. coastal waters, with the national fish tissue contaminant index rated fair for all three reports.